Check List the journal of biodiversity data

NOTES ON GEOGRAPHIC DISTRIBUTION

Check List 18 (4): 867–873
https://doi.org/10.15560/18.4.867

PENSOFT

Confirmation of the occurrence of Andean cottontail, *Sylvilagus andinus* (Thomas, 1897) (Leporidae, Lagomorpha), in Peru

Silvia Diaz[1*], Víctor Pacheco[1,2]

1 Departamento de Mastozoología, Museo de Historia Natural de la Universidad Nacional Mayor de San Marcos, Lima, Peru • SD: silvia.diaz2@unmsm.edu.pe https://orcid.org/0000-0002-9344-4991 • VP: vpachecot@unmsm.edu.pe https://orcid.org/0000-0002-1005-135X

2 Instituto de Ciencias Biológicas "Antonio Raimondi", Facultad de Ciencias Biológicas, Universidad Nacional Mayor de San Marcos, Lima, Peru

* Corresponding author

Abstract

Sylvilagus andinus (Thomas, 1897) is a highland lagomorph from the Ecuadorean Paramos. Its distribution was tentatively believed to extend to northwestern Peru on the basis of ecological niche modeling and the inclusion of the Peruvian *S. capsalis* Thomas, 1913 as a synonym. Here, we confirm the occurrence of *S. andinus* in Peru by a morphological examination of seven new records from northwestern Peru and one new record from Ancash department in central Peru.

Keywords

Ancash, Andes, Cajamarca, *Sylvilagus capsalis*, mammals, Paramos

Academic editor: Guilherme Garbino | Received 2 January 2022 | Accepted 6 June 2022 | Published 9 August 2022

Citation: Diaz S, Pacheco V (2022) Confirmation of the occurrence of Andean cottontail, *Sylvilagus andinus* (Thomas, 1897) (Leporidae, Lagomorpha), in Peru. Check List 18 (4): 867–873. https://doi.org/10.15560/18.4.867

Introduction

Cottontail rabbits of the genus *Sylvilagus* Gray, 1867 are highly speciose, with about 30 valid species (Ruedas et al. 2017, 2019). *Sylvilagus* is endemic to the Americas and is widely distributed from southeastern Canada to northern Argentina (Chapman and Ceballos 1990; Silva et al. 2019), occupying temperate, tropical, and subtropical habitats (Schai-Braun and Hackländer 2016).

Sylvilagus andinus (Thomas, 1897), commonly known as the Andean Cottontail, occurs in highlands in Venezuela, Ecuador, and Peru (Ruedas et al. 2017, 2019), but currently its presence in Peru is based only on the type specimen of *S. capsalis* Thomas, 1913, which has been considered a synonym of *S. andinus*, and on ecological niche modelling (Ruedas et al. 2017). To improve the resolution of this model and confirm the occurrence of the species in Peru, Ruedas et al. (2017) recommended examining additional specimens from the country and tentatively treated *S. capsalis* (type locality "San Pablo, Cajamarca [Peru]"), as well as other highland taxa from Ecuador and Venezuela (*S. meridensis* Thomas, 1904; *S. andinus chimbanus* Thomas, 1913; *S. a. canarius* Thomas, 1913; *S. a. carchensis* Hershkovitz, 1938; *S. a. chotanus* Hershkovitz, 1938; *S. nivicola* Cabrera, 1913; *S. kelloggi* Anthony, 1923; and *S. chillae* Anthony, 1923) as junior synonyms of *S. andinus* based on their elevation and habitat.

Thus, previous records of the Andean cottontails from Peru published as *S. brasiliensis* and other associated

©The authors. This is an open access article distributed under the terms of the Creative Commons Attribution License (CC BY 4.0), which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

names are now allocated to *S. andinus*. These Peruvian records of *S. andinus* include the one reported from Cutervo, Cajamarca (Thomas 1882, as *Lepus brasiliensis*), from San Pablo, Cajamarca (Thomas 1913, as *S. capsalis*), and from La Libertad and Cajamarca (Osgood 1914, as *S. capsalis*). Grimwood (1969) reported this species at 1500–3000 m from Piura, Cajamarca, and La Libertad but as *S. brasiliensis*. No additional records of northern Peruvian populations of *Sylvilagus* were published until Jiménez et al. (2010) recorded *S. brasiliensis* from Pagaibamba Protected Forest, Cajamarca department, based on indirect records (Table 1). More recently, Pacheco et al. (2020) tentatively recognized the Grimwood's (1969) historical records from northwestern Peru as *S. andinus* (sensu Ruedas et al. 2017).

Sylvilagus andinus has an important ecological role as a pervasive herbivore, consuming a wide variety of plant species (García et al. 2016). The species is also an important food source for several predators such as the Andean Fox *Lycalopex* (*Pseudalopex*) *culpaeus* (Molina, 1782) (Trujillo and Trujillo 2007; Cadena-Ortíz et al. 2020), Long-tailed Weasel *Neogale frenata* (Lichtenstein, 1831) (García et al. 2016), Mountain Lion *Puma concolor* (Linnaeus, 1771) (Hernandez-Guzman et al. 2011), and Black-chested Buzzard Eagle *Geranoaetus melanoleucus* (Vieillot, 1819) (Jimenez and Jaksic 1989). Despite this, *S. andinus* is still a poorly known rabbit and is currently classified as Data Deficient by the International Union for Conservation of Nature because distribution data are scarce compared to other cottontail species (Ruedas and Smith 2019).

Here, based on a direct examination of eight new specimens from eight localities, we confirm by our own morphological examination the presence of *S. andinus* in northwestern and central Peru.

Methods

We examined eight specimens housed in the mammal collection of the Museo de Historia Natural de la Universidad Nacional Mayor de San Marcos (MUSM), Lima, Peru. We took external measurements from specimen tags. We also estimated the head and body length (HBL) by subtracting the tail length (TailL) from the total length (TotalL). External measurements are reported to the nearest millimeter (mm). We took the cranial and mandibular measurements to the nearest 0.1 mm using dial calipers mainly following Ruedas et al. (2017): greatest length of skull (GLS), basilar length (BL), greatest rostrocaudal length of nasal bone (NL), greatest width across left and right nasal bones (NW), zygomatic breadth measured at zygomatic spine (BZS), zygomatic breadth (ZB), zygomatic length (ZL), dorsoventral depth of zygomatic arch (DZ), breadth of braincase (BB), width of cranium at exoccipital bones (WX), length of auditory bulla (LB), width of auditory bulla (WB), interorbital breadth (IOB), height of rostrum (HR), width of rostrum (WR), rostrocaudal length of incisive foramina (LIF), width of incisive foramina (WIF), palate length from henselion (HPL), rostrocaudal length of palatal bridge (PBL), width of choana at first upper molar (WCH), breadth of alisphenoid constriction (BAC), alveolar length of maxillary toothrow (ATL), alveolar length of upper diastema I2–PM2 (DL), dentary toothrow length (DTL). We followed the age classification of Hoffmeister and Zimmerman (1967), and the taxonomic identification followed Thomas (1897), Hershkovitz (1938, 1950), and Ruedas et al. (2017, 2019).

Our samples also included one photograph and two sighting records with accurate coordinates housed in a separate database (MUSM2). Finally, we present a map (Fig. 1) based on vouchers and indirect records for *Sylvilagus andinus* from Peru and Ecuador (Table 1).

Results

After a morphological revision of *Sylvilagus* specimens housed in the MUSM, which were previously identified as *S. brasiliensis* following Hershkovitz (1950) and Hoffmann and Smith (2005), we confirm the presence of *S. andinus* in seven different localities in northwestern Peru and one record from central Peru (Table 1; Fig. 1).

New records. PERU – **Piura** • Huancabamba, Huancabamba, Pariamarca Alto; −05.1596, −079.5485; 2991 m elev.; 27.IV.2006; Víctor Pacheco leg.; photograph; 1 sex indet., MUSM2 33 – **Lambayeque** • Lambayeque, Salas, Sarismisa, near CC.PP. Palacios; −06.0210, −079.5378; 1085 m elev.; 25.VI.2009; Richard Cadenillas leg.; 1 skin fragment, MUSM 34654 • Ferreñafe, Cañaris, Cañaris; −06.0934, −079.2799; 3244 m elev.; 01.IV.2011; Marina Villalobos leg.; 1 ♀, MUSM 55249 – **Cajamarca** • Cutervo, Cutervo, Cutervo; −06.3790, −078.8179; 2632 m elev.; 31.VII.1946; Javier Ortiz de la Puente leg.; 1 ♂, MUSM 2071 • Santa Cruz, Catache, 2 Km E Monteseco; −06.8441, −079.0907; 2000 m elev.; 25.VI.1996; Víctor Pacheco leg.; 1 ♂, MUSM 55796 • Celendín, Sorochuco, Santa Rosa de Milpo; −06.9609, −078.3075; 3905 m elev.; 31.III.2006; Alfonso Miranda leg.; 1 sex indet., MUSM 23173 • Cajamarca, Namora, CC.PP. Namora; −07.2077, −078.3183; 2776 m elev.; 08.IX.2011; Liz Huamaní leg.; 1 skin fragment, MUSM 37972 • Contumazá, Contumazá, Bosque Cachil; −07.3973, −078.7798; 2484 m elev.; 04.IX.2018; Andderson Solis obs. – **La Libertad** • Sánchez Carrión, Sanagorán, Sanagorán; −07.7921, −078.1384; 2775 m elev.; 18.VI.2007; Lucía Luna leg.; Victor® mouse trap; 1 ♂ juvenile, MUSM 46735 – **Ancash** • Pallasca, Conchucos, Quebrada Toldobamba Vivero Cumbal; −08.2505, −077.8351; 3580 m elev.; 11.IV.2005; Víctor Pacheco leg.; Victor® mouse trap; 1 ♀ juvenile, MUSM 23254.

Sylvilagus andinus predominantly inhabits shrubby and interandean forests in the ecoregions of Montane Forest and Paramo (sensu Brack-Egg 1986) or North-Western Pluvial Montane Forest, Seasonal Dry Forest, Mid-Andean, Scrub Desert-Dry Forest, and Humid-Dry Puna (sensu Britto 2017). Vouchers were predominantly

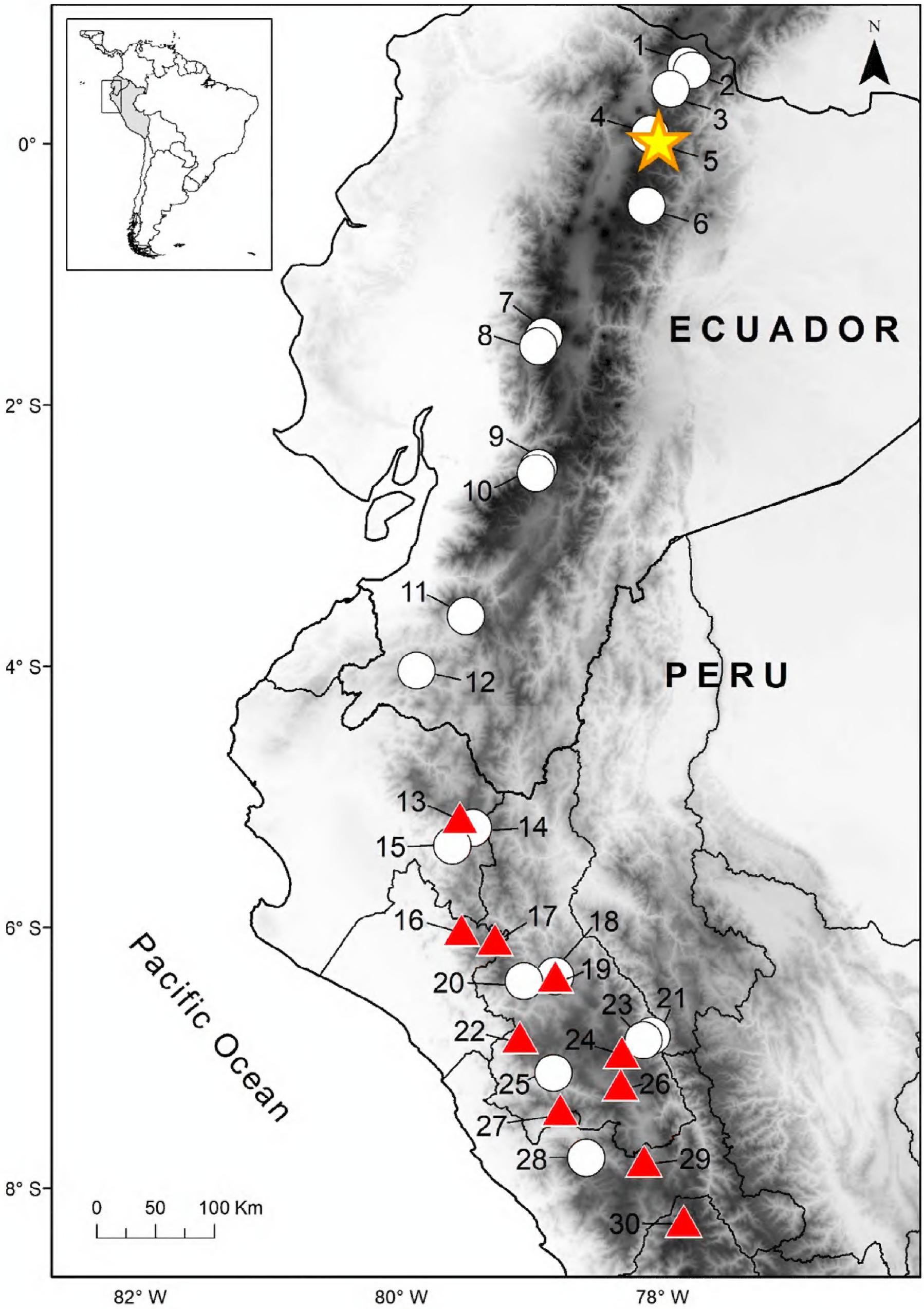

Figure 1. Distribution range of *Sylvilagus andinus*. Type locality is represented by the yellow star, previous records (as *S. brasiliensis*) by white circles and new records by red triangles. For detailed locality data see Table 1.

Table 1. Summary of locality records for *Sylvilagus andinus*. The locality numbers refer to the points shown in Figure 1. The specimens reported below are deposited in the following institutional collections: American Museum of Natural History, New York (AMNH); Field Museum of Natural History, Chicago (FMNH); The Natural History Museum, London (NHMUK); Museo de Historia Natural de la Universidad Nacional Mayor de San Marcos, Lima (MUSM); Museo Nacional de Ciencias Naturales, Madrid (MNCN); Smithsonian National Museum of Natural History, Washington DC (USNM); University of Michigan Museum of Zoology, Ann Arbor (UMMZ).

Locality no.	Country	Locality	Latitude	Longitude	Voucher	Reference
1	Ecuador	Carchi; Montufar, near San Gabriel	00.6000	−077.8170	UMMZ 77063	Diersing and Wilson 2017
2	Ecuador	Carchi; Montufar, about 5 miles SW of San Gabriel	00.5658	−077.7724	UMMZ 77062	Ruedas et al. 2017
3	Ecuador	Imbabura; Pimanpiro, slopes of the Chota Valley	00.4204	−077.9360	UMMZ 77061	Ruedas et al. 2017
4	Ecuador	Pichincha; Cayambe, near Cangagua	00.0761	−078.0937	UMMZ 77072	Ruedas et al. 2017
5	Ecuador	Pichincha; W slope of Cayambé Mountain, Eastern Cordillera of Ecuador	00.0298	−078.0241	NHMUK 1897.11.7.54	Thomas 1897
6	Ecuador	Pichincha; Mount Antisana, Cordillera Occidental	−00.4740	−078.1208	MNCN 749	Ruedas et al. 2017
7	Ecuador	Bolivar; W slope of Mt. Chimborazo	−01.4751	−078.9083	NHMUK 1899.9.9.114	Ruedas et al. 2017
8	Ecuador	Bolivar; Sinche	−01.5500	−078.9500	USNM 141516	Diersing and Wilson 2017
9	Ecuador	Cañar; San Antonio	−02.4833	−078.9500	AMNH 63564	Diersing and Wilson 2017
10	Ecuador	Cañar; Cañar, Andes of Ecuador	−02.5228	−078.9667	NHMUK 1899.9.9.123	Diersing and Wilson 2017
11	Ecuador	El Oro; Cordillera de Chilla	−03.6172	−079.5033	AMNH 60511	Ruedas et al. 2017
12	Ecuador	Loja; Guachanamá	−04.0333	−079.8833	AMNH 60515	Diersing and Wilson 2017
13	Peru	Piura; Pariamarca Alto	−05.1596	−079.5485	MUSM2 33	This study
14	Peru	Piura; Huancabamba	−05.2390	−079.4507	AMNH 64046	Diersing and Wilson 2017
15	Peru	Piura; Canchaque	−05.3760	−079.6098	FMNH 81194	Diersing and Wilson 2017
16	Peru	Lambayeque; Sarismisa, near CC.PP. Palacios	−06.0210	−079.5378	MUSM 34654	This study
17	Peru	Lambayeque; Cañaris	−06.0934	−079.2799	MUSM 55249	This study
18	Peru	Cajamarca; Cutervo	−06.3760	−078.8213	Stolzmann collection	Thomas 1882
19	Peru	Cajamarca; Cutervo	−06.3790	−078.8179	MUSM 2071	This study
20	Peru	Cajamarca; Pagaibamba Protection Forest, near Querocoto village	−06.4126	−079.0589	Skin and osseous rests	Jimenez et al. 2010
21	Peru	Cajamarca; Hacienda Limón	−06.8333	−078.0833	Sigthing	Osgood 1914
22	Peru	Cajamarca; 2 km E Monteseco	−06.8441	−079.0907	MUSM 55796	This study
23	Peru	Cajamarca; Celendín	−06.8668	−078.1444	NHMUK 1826.5.3.147	Diersing and Wilson 2017
24	Peru	Cajamarca; Santa Rosa de Milpo	−06.9609	−078.3075	MUSM 23173	This study
25	Peru	Cajamarca; San Pablo, Cajamarca, Pacific slope of N Peru	−07.1167	−078.8333	NHMUK 1900.3.15.29	Thomas 1913
26	Peru	Cajamarca; CC.PP. Namora	−07.2077	−078.3183	MUSM 37972	This study
27	Peru	Cajamarca; Bosque Cachil	−07.3973	−078.7798	Sighting	This study
28	Peru	La Libertad; Hacienda Llagueda	−07.7667	−078.5833	FMNH 19483	Osgood 1914
29	Peru	La Libertad; Sanagorán	−07.7921	−078.1384	MUSM 46735	This study
30	Peru	Ancash; Quebrada Toldobamba, Vivero Cumbal	−08.2505	−077.8351	MUSM 23254, sighting	This study

collected during the rainy season.

Identification. *Sylvilagus andinus* is a medium-sized species (HBL 326–353 mm) with a small tail (6–7% of HBL) and long hindfeet (64–81 mm) (Table 2), characterized by the following combination of external and craniodental characters: pelage long, soft, dusky in appearance; forehead suffused with brownish; small nostril patches white; ears rather short, gray basally; cheeks and sides of neck ashy gray; back awns hairs long, colored warm buff to clay color irregularly streaked with black presenting a saturated general appearance; rump with a reddish suffusion which passes down on the legs to the heels; chin and belly whitish; underhairs woolly gray; upper surface of fore and hind feet pale, with more white than ochraceous; soles of feet thickly furred, brown; tail a mere stump colored like the rump (concurring with Thomas 1897 and Hershkovitz 1950). The skull is large and robust, the dorsal surface of the cranium is smooth and lacks pitting; fenestrated rostrum short and broad; braincase concave; antorbital process minute; postorbital process relatively short not coalescing with the frontal; tuberculum frontoparietale prominent and smooth; zygomatic arch dorsoventrally slender; zygomatic fossa barely perceptible; frontoparietal suture weakly interdigitated with no fusion between the bones; frontonasal suture sharply V-shape; single craniopharyngeal foramen in basisphenoid; premolar foramen present (concurring with Thomas 1897 and Ruedas et al. 2017). Crown enamel pattern of third lower premolar (p3) with multiple, deep anteroflexid invaginations into rostral aspect of anterior lobe; rostral aspect of p3 hypoflexid heavily crenellated from anteroconid to paraflexid; deep, crenellated paraflexus, with generally conspicuous hypoflexus in second upper premolar (P2) (concurring with Ruedas et al. 2017).

As mentioned by Hershkovitz (1950), *S. brasiliensis* s.l. (lowland Peruvian population) can be differentiated from *S. andinus* by the following external characters: *S. brasiliensis* has ochraceous-buff back, ochraceus-tawny rump, and warm buff cheeks, while *S. andinus* has warm buff back and rump and ashy gray cheeks. No other revision has included the Peruvian lowland population of *Sylvilagus*. Ruedas et al. (2017) identified the following craniodental features that distinguish *S. brasiliensis* s.s. (Brazilian population) from *S. andinus* (Ecuadorean population): *S. brasiliensis* s.s. has longer postorbital

Table 2. External and skull measurements (in mm) of the holotype of *Sylvilagus andinus* (Thomas 1897; Ruedas et al. 2017) and collected specimens from Cañaris, Lambayeque (MUSM 55249), Monteseco, Cajamarca (MUSM 55796), and Sanagorán, La Libertad (MUSM 46735).

Variables	NHMUK 1897.11.7.54	MUSM 55249	MUSM 55796	MUSM 46735
Sex	Female	Female	Male	Male
Age	Adult	Adult	Adult	Juvenile
TotalL	361	—	340	—
TailL	21	10	10	5
HBL	340	—	330	—
HFL	68	75	81	60
Ear	55	52	50	45
GSL	69.70	67.59	68.43	52.49
BL	55	51.79	53.17	39.07
NL	26.90	27.50	—	19.85
NW	14.30	12.36	—	9.21
BZS	32.20	34.14	—	26.92
ZB	33.40	33.96	32.00	28.22
ZL	31.40	28.58	29.34	22.65
DZ	4.30	3.81	3.90	3.22
BB	24.80	25.22	24.10	21.61
WX	22.70	22.56	23.04	18.23
LB	8.70	8.23	8.05	7.18
WB	4.90	5.20	6.04	4.70
IOB	12.10	15.85	16.19	10.80
HR	12.20	14.10	12.08	10.08
WR	12.20	11.67	—	9.61
LIF	17.50	16.68	17.82	12.48
WIF	5.20	6.12	—	5.07
HPL	28.30	27.01	29.19	22.06
PBL	7.10	6.54	6.19	5.35
WCH	5.30	5.81	6.05	3.94
BAC	8.70	9.75	9.37	8.88
ATL	12.80	13.44	13.25	10.51
DL	18.90	18.45	19.35	13.87
DTL	14.60	14.04	14.02	11.46

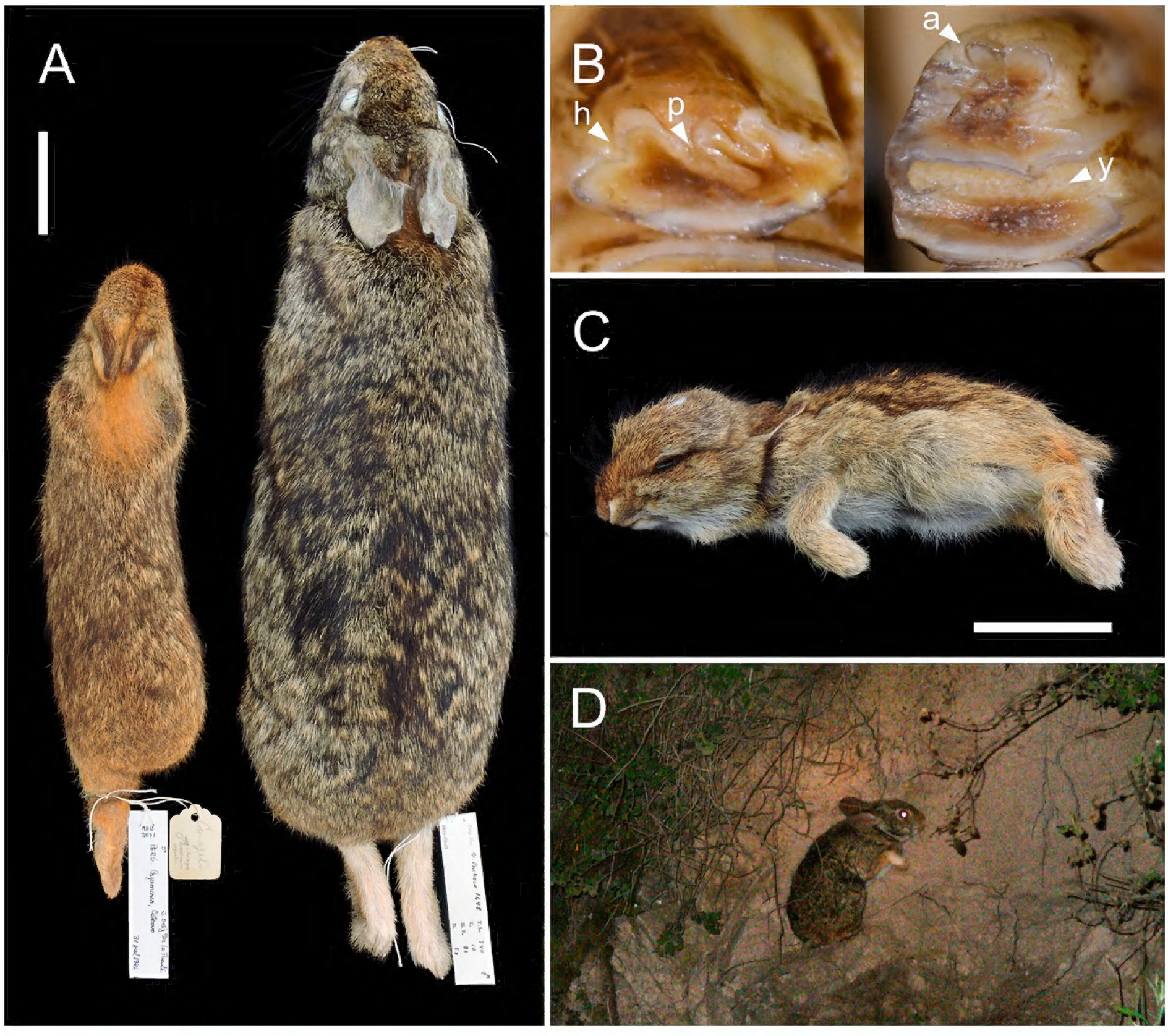

Figure 2. New records of the Andean cottontail *Sylvilagus andinus* from Peru. **A.** Dorsal view of skin specimens from Cutervo (left, juvenile MUSM 2071) and Monteseco (right, adult MUSM 55796) both in Cajamarca. **B.** Second left upper premolar (left) and third right lower premolar (right) of one specimen from Cañaris, Lambayeque (MUSM 55249) showing diagnostic characteristics: h, presence of hypoflexus; p, crenellated paraflexus; a, multiple anteroflexids; y, crenellated hypoflexid. **C.** Lateral view of fluid specimen from Conchucos, Ancash (MUSM 23254). **D.** Individual from Pariamarca Alto, Piura in its natural habitat (MUSM2 33). Scale bars = 50 mm.

processes ending broadly rounded and fused to the frontal; U-shaped frontonasal suture; single simple shallow anteroflexid, paraflexid and protoflexid; smooth hypoflexid; absence of hypoflexus; and simple deep paraflexus; in contrast, *S. andinus* (Ecuadorean population) has shorter, V-shaped postorbital processes not coalescing with the frontal; V-shaped frontonasal suture; multiple invaginations in the anteroflexid, paraflexid and protoflexid; crenellated hypoflexid; presence of hypoflexus; and crenellated paraflexus. Following Ruedas et al. (2017), our specimens correspond to *S. andinus* because of the aforementioned characteristics for the species (Fig. 2).

Discussion

Our study confirms the presence of *Sylvilagus andinus* in Peru based on the direct examination of eight specimens, two sightings, and one photograph, from eight localities, which range in elevation from 1085 m (MUSM 34654) to 3905 m (MUSM 23173). Our specimens exhibit the characteristics that differentiate *S. andinus* from *S. brasiliensis* (Figs. 2, 3), following Ruedas et al. (2017, 2019), but we are aware that some authors are still lumping *andinus* and other Andean forms under *S. brasiliensis* (Diersing and Wilson 2017) without additional arguments.

We also extend the current distribution range of the species by about 169 km southeast from San Pablo, Cajamarca department (type locality of *S. capsalis*; Fig. 1) to Ancash department in central Peru (MUSM 23254). Records of this species are rare because it seems to avoid commonly used traps; nonetheless, the records presented here show that it is more widely distributed than previously thought. Little is known regarding the natural history this species, but it is known that lowland tropical forest cottontails have been trapped in Tomahawk traps set in native gardens and baited with yuca (Voss and Emmons 1996). Two specimens, which were determined as juveniles based on general size and cranial features, were trapped using Victor® mouse traps with standard bait (Pacheco et al. 2007), probably because of their inexperience.

Although the phenotype of our specimens matches the diagnostic characters of *S. andinus*, we observed morphological variability in three adult specimens: the premolar foramen and the antorbital process of the interorbital region were present only in MUSM 55249 (Fig. 3). Also, a smooth braincase was seen only in MUSM 46735 and MUSM 55796. These characters were indicated as diagnostic for *S. andinus*, but our observations suggest they could be individual or geographic variation. Documented morphological data for this species are scarce (Thomas 1897, 1913; Ruedas et al. 2017, 2019; Diersing and Wilson 2017), which limits our understanding of age, sex, and population variability. Therefore, pending a thorough revision of the Andean forms, we tentatively follow the latest revision of the genus (Ruedas et al. 2017, 2019). Although our study improves the current distribution of

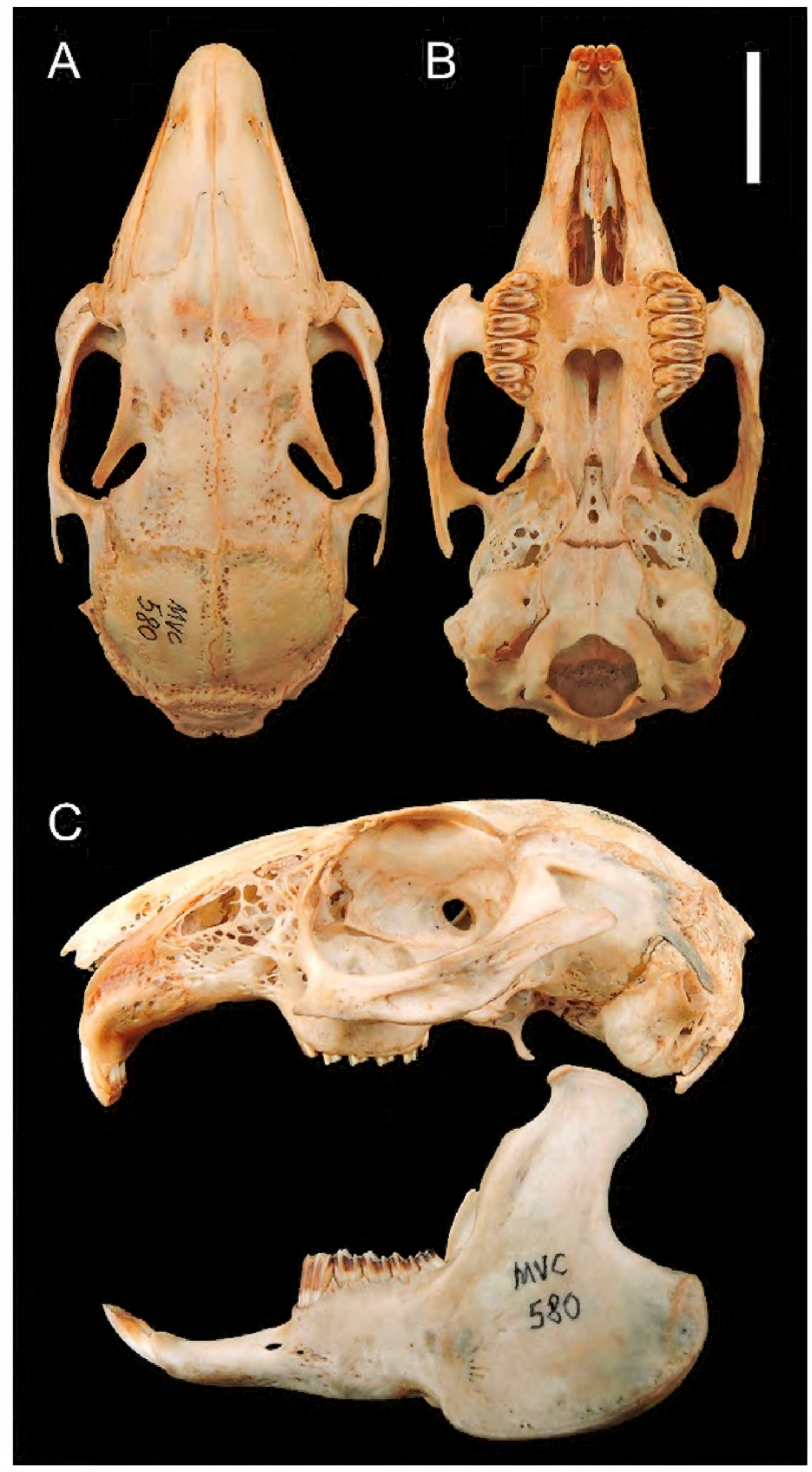

Figure 3. Skull of *Sylvilagus andinus* (MUSM 55249) from Cañaris, Lambayeque. **A.** Dorsal view of the cranium. **B.** Ventral view of the cranium. **C.** Lateral view of the cranium and mandible. Scale bar = 15 mm.

S. andinus, we acknowledge that a larger set of samples is needed to properly assess intraspecific variability. While this contribution considerably extends the southern range of the species and provides important natural history information, we recommend that additional studies be undertaken to fully assess the taxonomic, distribution, and conservation status of *S. andinus*.

Acknowledgements

We want to thank the collectors of the specimens of *Sylvilagus* in the MUSM, including Lynn Marina Villalobos, Richard Cadenillas, Lucia Luna, Liz Huamani, and Alfonso Miranda. We also thank Sandra Velazco and Alicia Rodriguez for field support, and Andderson Solis for sharing with us his sighting records. We especially thank José Serrano-Villavicencio, Catherine Sahley, and Klauss Cervantes, as well as the editors Guilherme Garbino and Robert Forsyth, the reviewer Sergio Solari, and two anonymous reviewers, for providing valuable

comments on the manuscript and improving the English. The non-profit organization Idea Wild donated equipment necessary for this work. This research was supported by the Universidad Nacional Mayor de San Marcos (RR no. 2020-01686 and project number B20100321, RR no. 2021-05753 and project number B21100031), and the Asociación de Mastozoólogos del Perú (Carta no. 002-AMP-2020 and code VP002).

Authors' Contributions

Conceptualization: VP. Formal analysis: SD. Funding acquisition: SD, VP. Investigation: SD. Methodology: SD. Project administration: VP. Supervision: VP. Visualization: SD. Writing – original draft: SD. Writing – review and editing: VP.

References

Anthony HE (1923) Preliminary report on Ecuadorean mammals. No. 3. American Museum Novitates 55: 1–14.

Brack-Egg E (1986) Las ecorregiones del Perú. Boletín de Lima 44: 57–70.

Britto B (2017) Actualización de las ecorregiones terrestres de Perú propuestas en el libro rojo de plantas endémicas del Perú. Gayana Botánica 74 (1): 15–29. https://doi.org/10.4067/s0717-66432017005000318

Cabrera A (1913) Dos mamíferos nuevos de la fauna Neotropical. Trabajos del Museo de Ciencias Naturales, Serie Zoológica 9: 3–15.

Cadena-Ortíz H, Ordóñez-Pozo C, Freire E, Brito J (2020) Dieta del zorro andino *Lycalopex culpaeus* (Molina, 1782) (Mammalia: Carnivora: Canidae) en la Reserva Ecológica Los Ilinizas, Ecuador. Ecotrópicos 32: e0011.

Chapman JA, Ceballos G (1990) The cottontails. In: Chapman JA, Flux JEC (Eds.) Rabbits, hares and pikas, status survey and conservation action plan. IUCN/SSC Lagomorph Specialist Group. Information Press, Oxford, UK, 95–108.

Diersing VE, Wilson DE (2017) Systematic status of the rabbits *Sylvilagus brasiliensis* and *S. sanctaemartae* from northwestern South America with comparisons to Central American populations. Journal of Mammalogy 98 (6): 1641–1656. https://doi.org/10.1093/jmammal/gyx133

García J, Suárez E, Zapata-Ríos G (2016) An assessment of the populations of *Sylvilagus brasiliensis andinus* in Páramos with different vegetation structures in the northeastern Andes of Ecuador. Neotropical Biodiversity 2 (1): 72–80. https://doi.org/10.1080/23766808.2016.1179846

Grimwood IR (1969) Notes on the distribution and status of some Peruvian Mammals 1968. Special Publication, American Committee for International Wildlife Protection 21: 1–86.

Hernandez-Guzman A, Payan E, Monroy-Vilchis O (2011) Food habits of *Puma concolor* (Carnivora: Felidae) in the Parque Nacional Natural Purace, Colombia. Revista de Biología Tropical 59: 1285–1294.

Hershkovitz P (1938) A review of the rabbits of the *andinus* group and their distribution in Ecuador. Occasional papers of the Museum of Zoology, University of Michigan 393: 1–15.

Hershkovitz P (1950) Mammals of northern Colombia. Preliminary report no. 6: rabbits (Leporidae), with notes on the classification and distribution of the South American forms. Proceedings of the United States National Museum 100 (3265): 327–375. https://doi.org/10.5479/si.00963801.100-3265.327

Hoffmann RS, Smith AT (2005) Order Lagomorpha. In: Wilson E, Reeder DE (Eds.) Mammal species of the world, a taxonomic and geographic reference. 3rd edition. Vol. 1. The Johns Hopkins University Press, USA, 185–211.

Hoffmeister DF, Zimmerman EG (1967) Growth of the skull in the cottontail (*Sylvilagus floridanus*) and its application to age-determination. American Midland Naturalist 78 (1): 198–206. https://doi.org/10.2307/2423380

Jimenez JE, Jaksic JM (1989) Behavioral ecology of Grey Eagle-Buzzards, *Geranoaetus melanoleucus* in Central Chile. The Condor 91: 913–921.

Jiménez CF, Quintana H, Pacheco V, Melton D, Torrealva J, Tello G (2010) Camera trap survey of medium and large mammals in a montane rainforest of northern Peru. Revista Peruana de Biología 17(2): 191–196.

Linnaeus C (1758) Sistema naturæ per regna tria naturæ, secundum classes, ordines, genera, species, cum characteribus, differentiis, synonymis, locis. Editio decima, reformata. Tomus I: regnum animale. Laurentii Salvii, Stockholm, Sweden, 823 pp.

Osgood WH (1914) Mammals of an expedition across northern Peru. Field Museum of Natural History, Zoological Series 10 (12): 143–185. https://doi.org/10.5962/bhl.title.2597

Pacheco V, Salas E, Cairampoma L, Noblecilla M, Quintana H, Ortiz F, Palermo P, Ledesma R (2007) Contribución al conocimiento de la diversidad y conservación de los mamíferos en la cuenca del río Apurímac, Perú. Revista Peruana de Biología 14 (2): 169–180.

Pacheco V, Graham-Angeles L, Diaz S, Hurtado CM, Ruelas D, Cervantes K, Serrano-Villavicencio J (2020) Diversidad y distribución de los mamíferos del Perú por departamentos y ecorregiones I. Revista Peruana de Biología 27 (3): 289–328. https://doi.org/10.15381/rpb.v27i3.18356

Ruedas LA, Silva SM, French JH, Platt RN, Salazar-Bravo J, Mora JM, Thompson CW (2017) A prolegomenon to the systematics of South American cottontail rabbits (Mammalia, Lagomorpha, Leporidae: *Sylvilagus*): designation of a neotype for *S. brasiliensis* (Linnaeus, 1758), and restoration of *S. andinus* (Thomas, 1897) and *S. tapetillus* Thomas, 1913. Miscellaneous Publications, Museum of Zoology, University of Michigan 205: 1–67.

Ruedas LA, Smith AT (2019). *Sylvilagus andinus* (errata version published in 2020). The IUCN Red List of Threatened Species 2019: e.T142541491A165117323. https://doi.org/10.2305/iucn.uk.2019-2.rlts.t142541491a165117323.en. Accessed on: 2021-6-3.

Ruedas LA, Silva SM, French JH, Platt RN, Salazar-Bravo J, Mora JM, Thompson CW (2019) Taxonomy of the *Sylvilagus brasiliensis* complex in Central and South America (Lagomorpha: Leporidae). Journal of Mammalogy 100 (5): 1599–1630. https://doi.org/10.1093/jmammal/gyz126

Schai-Braun SC, Hackländer K (2016) Family Leporidae (hares and rabbits). In: Wilson DE, Lacher TE Jr, Mittermeier RA (Eds.) Handbook of the mammals of the world. Vol. 6. Lagomorph and rodents I. Lynx Edicions, Barcelona, Spain, 62–121.

Silva SM, Ruedas LA, Santos LH, Sousa e Silva Jr. J, Aleixo A (2019) Illuminating the obscured phylogenetic radiation of South American *Sylvilagus* Gray, 1867 (Lagomorpha: Leporidae). Journal of Mammalogy 100 (1): 31–44. https://doi.org/10.1093/jmammal/gyy186

Thomas O (1882) On a collection of rodents from north Peru. Proceedings of the Zoological Society of London 50 (1): 98–111.

Thomas O (1897) Descriptions of new bats and rodents from America. Annals and Magazine of Natural History (Series 6) 20 (120): 544–553. https://doi.org/10.1080/00222939709487398

Thomas O (1913) Notes on S. American Leporidae. Annals and Magazine of Natural History (Series 8) 11 (62): 209–214. https://doi.org/10.1080/00222931308693309

Trujillo F, Trujillo J (2007) Alimentación del lobo (*Lycalopex culpaeus*), en el bosque protector Jerusalem, Guayllabamba-Ecuador. Politécnica 27: 68–75.

Voss RD, Emmons LH (1996) Mammalian diversity in Neotropical lowland rainforests: a preliminary assessment. Bulletin of the American Museum of Natural History 230: 1–115.